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Hyperspectral Airborne Remote Sensing for Coastal Monitoring

Introduction

Coastal zone management and coastal monitoring try to assemble a balance between the protection and the sustainable economic development of coastal regions. For this, detailed knowledge about coastal biotopes and their dynamics is essential.

AWI's new hyperspectral camera AISA Eagle will provide spatially and spectrally highly dissolved data to offer solutions for efficient coastal zone management and research.

In co-operation with OHB System AG Bremen the sensor will be mounted

• to a wingpod of the motor glider Condor Stemme S10 of OHB (Fig. 1)
• to the Polar 5 research aircraft (Fig. 2).

Figure 1: Condor Stemme S10
Photo: OHB System AG

Figure 2: Polar 5 (Basler BT 67)
Photo: Jim Watsen, LCAS

Hyperspectral sensor AISA Eagle

The hyperspectral camera AISA Eagle (Airborne Imaging System for different Applications) (Fig. 3) is a so-called pushbroom scanner, which is equipped with a CCD detector array.

Figure 3: The sensor AISA Eagle.

Specifications:
•Spectral range: 400-970 nm
• Spectral resolution: 2.9 nm
• Up to 488 spectral channels
• FOV (field of view): 37.7°
• Ground resolution at 1000m altitude: 68 cm

Project InnoHyp*

The project has three aims:
• the modular integration of the AISA sensor into the motor glider Stemme S10
• measurement campaigns to explore the sensor capabilities for coastal remote sensing
• classification of different macrophytes of the Helgoland rocky intertidal.

An additional GPS/INS sensors will register the position, pitch, roll and yaw movements of the airplane so that the sensor data can be (

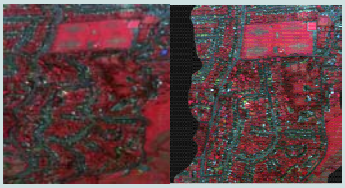

Figure 4: False-color images taken with AISA Eagle. Left: not georectified, right: georectified

Project CoastEye**

This second project is a continuation of InnoHyp and has two main aims:
• evaluation of hyperspectral data of coastal biotopes
• co-operation with external users to develop remote sensing solutions that closely match the user requirements.

Example Helgoland

In 2002 and 2003 first hyperspectral (ROSIS scanner) airborne remote sensing flights took place over Helgoland. Mapping of small scale coastal biotopes in the range of meters is possible (Fig. 5) but needs improvement.

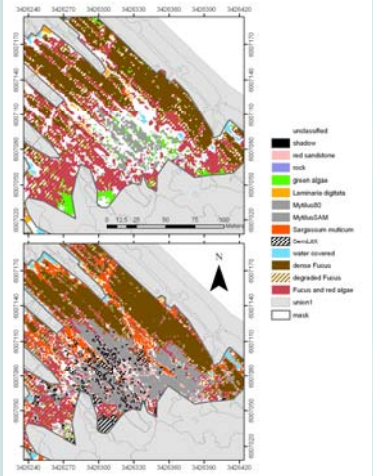

Figure 5: ROSIS Classes of intertidal biotopes at Helgoland in July 2002 (above) and Sept. 2003 (below) (Thiemann and Bartsch, unpublished)

Based on this research, the new sensor AISA Eagle will provide a good tool to further develop this technique for general questions.

Summary

• The mapping of coastal biotopes is important for the coastal zone management and sustainable economic development
• Hyperspectral airborne remote sensing is a flexible high resolution instrument for the monitoring of such biotopes.
• The projects InnoHyp and CoastEye develop a process chain for hyperspectral airborne remote sensing research or products.

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